

SEQUENCE LISTING

- <120> METHOD FOR PREPARING 1,3-PROPANEDIOL BY A RECOMBINANT
 MICRO-ORGANISM IN THE ABSENCE OF COENZYME B12 OR ONE OF
 ITS PRECURSORS
- <130> CHEP:004US
- <140> 10/043,639
- <141> 2002-01-09
- <150> PCT/FR00/01981
- <151> 2000-07-07
- <150> FR 99/08939
- <151> 1999-07-09
- <160> 10
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85 90 95

Val Gly Gly Ser Ser His Asp Cys Gly Lys Gly Ile Gly Ile Ala 100 105 110

Ala Thr His Glu Gly Asp Leu Tyr Asp Tyr Ala Gly Ile Glu Thr Leu 115 120 125

Val Asn Pro Leu Pro Pro Ile Val Ala Val Asn Thr Thr Ala Gly Thr 130 135 140

Ala Ser Glu Leu Thr Arg His Cys Val Leu Thr Asn Thr Lys Lys

145 150 155 160

Ile Lys Phe Val Ile Val Ser Trp Arg Asn Leu Pro Leu Val Ser Ile
165 170 175

Asn Asp Pro Met Leu Met Val Lys Lys Pro Ala Gly Leu Thr Ala Ala 180 185 190

Thr Gly Met Asp Ala Leu Thr His Ala Ile Glu Ala Tyr Val Ser Lys 195 200 205

Asp Ala Asn Pro Val Thr Asp Ala Ser Ala Ile Gln Ala Ile Lys Leu 210 215 220

Ile Ser Gln Asn Leu Arg Gln Ala Val Ala Leu Gly Glu Asn Leu Glu 225 230 235 240

Ala Arg Glu Asn Met Ala Tyr Ala Ser Leu Leu Ala Gly Met Ala Phe 245 250 255

Asn Asn Ala Asn Leu Gly Tyr Val His Ala Met Ala His Gln Leu Gly 260 265 270

Gly Leu Tyr Asp Met Ala His Gly Val Ala Asn Ala Met Leu Leu Pro 275 280 285

His Val Glu Arg Tyr Asn Met Leu Ser Asn Pro Lys Lys Phe Ala Asp 290 295 300

Ile Ala Glu Phe Met Gly Glu Asn Ile Ser Gly Leu Ser Val Met Glu 305 310 315 320

Ala Ala Glu Lys Ala Ile Asn Ala Met Phe Arg Leu Ser Glu Asp Val 325 330 335

Gly Ile Pro Lys Ser Leu Lys Glu Met Gly Val Lys Gln Glu Asp Phe 340 345 350

Glu His Met Ala Glu Leu Ala Leu Leu Asp Gly Asn Ala Phe Ser Asn 355 360 365

Pro Arg Lys Gly Asn Ala Lys Asp Ile Ile Asn Ile Phe Lys Ala Ala 370 375 380

Tyr

385

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OIPE

RAW SEQUENCE LISTING

PATENT APPLICATION: US/10/043,639A

DATE: 04/24/20:13

TIME: 16:21:33

Input Set : D:\Chep004.app

Output Set: N:\CRF4\04242003\J043639A.raw

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              CEOUX, CHEISTIAN
              SOUCAILLE, PHILIPPE
       <120 - TITLE OF INVENTION: METHOD FOR PREPARING 1,3-PROPANEDIOL BY A RECOMBINANT</p>
             MICRO-ORGANISM IN THE ABSENCE OF COENZYME B12 OR ONE OF
              ITS PRECUESORS
     11 <130 - FILE REFERENCE: CHEP: CO4US
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C--> 14 <141> CURRENT FILING DATE: 2003-04-12
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     17 +151 + PRIOR FILING DATE: 2000-07-07
     19 -150 - PRIOR APPLICATION NUMBER: FR 99/03939
     20 K151 - PRIOR FILING DATE: 1999-07-09
     11 -160 NUMBER OF SEQ ID NOS: 10
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     De HAMO: SEO ID NO: 1
     .7 -0.11 - LENGTE: 2364
     TYPE: DNA
     29 - 213 - OFGANISM: Clostridium butyricum
     31 -400 > SEQUENCE: 1
     30 utgahaagta aaggalittag tabbbaasda gaaagsataa atattttasa ggotbaaata 🍪
     Po tisaatgota aabbatgigt tgaatbagaa agagbaatat taataabaga atbatttaaa 170
     34 masabagaan gobagobago sattittaaga agagoattigo battigaaaba batabttigaa 180
     35 uatatooota taacaattag agateaagaa ottatagtgg gaagtttaac taaagaacca 240
     36 Systettoso aagtauttoo toagtittiot aataagtogot tacaagatga attogataga 300
     37 ttaabtaaga gaustggaga tgoattosaa atttoagaag saagtaaaga aaaattaasa 300
     36 qatqtotttq aqtattqqaa tqqaaaqaca abaaqtqaqt taqbaacttc atatatqaca 410
     39 maggaaadaa gayaggdagt aaattigtgaa gtatttadtg taggaaadta stattataat 480
     40 ggognaggad atqtatotgt agattatgga aaagtattaa gggttggatt taatgggatt 540\,
     41 atawatgagg otwaggwaca witagawawa wacaggagta tagatootga tittatawag 600
     4% aaagkaaaat tootakatag tittattato toatgogaag otgoaataac atatgtaaat 660
     40 agatatgota aawaggotaa agagattgoa gataatabaa gtgatgoaaa aagaaaagot 710
     44 gaattaaatg aawtaqbaaa aatttgttoa saagtttbag gagagggago taaatottto 780
     48 tatgaagoat gibaaktatt tiggittatt batgoaataa taaatataga abbiaatgga 840
     40 patietatit etopagetag attidateaa tapatgiate eatattatga aaatgataaa 900
     47 aatataacag atmagtitigo toaagaatta atagattigta totiggattaa attaaatigat 960
     48 attaataaag taagagatga gatttoaact aaacattttg gtggttaccc aatgtatcaa 1020
     49 aaattaattig tigggggica aaattoaqaa ggaaaagatig caactaataa agtatoatat 1c80
     50 atggcattag aagsagetgt eeatgtaaag tigseteags catetitigte agtaagaata 1140
     51 tygaataaqa otobagatga attittigott agagbagbag aattaabtay agaaqquita 1100
     52 againteesta ottattataa toatdaadtt attattopad pattadttto tadadutett 11.67
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54 aaaacagaag gatggbatga tibadhatto titaatotta caagaatagt adagttaact 1390

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DATE: 04/24/2003

Input Set : D:\Chep004.app

Output Set: N:\CRF4\04242003\J043639A.raw

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55 ataaattotg gatttgataa aaataaacag attggacota aaactcaaaa tittgaagaa 1443
\pm 6 atgaaatoot itgatgaatt batgaaagot tataaagoto aaatggagta tittt{
m gtaa}aaa 1500
z^{\infty} catatytyst ytystyataa tigeatayat attycasaty sagaaayays tosattassi 15\,6\%
En ttottgtbat baatggttga taattgtato ggaaaaggaa agagbottba agatggtggt 1623
60 goagaatata acttoagtgg accacaaggt gttggagtag ctaatattgg agattoatta 1000
\phi \theta gttgdagtta aasaasttgt gtttgatgas astaagatta otoottdaga attaasgass 1.44
🍪 adattaaata atgattitaa aaattoagaa gaaatadaag dottadtaaa aaatgotoot 1860
w. Aagttttggaa atgatattga tgaagttgat aatttagota gagagggtgo attagtatao 1866
65 tytaqaqaag teaataaata tacaaateea aqqqqaqqaa attiteaase aqqattatat 1920
64 opatottoaa ttaatgtata tittggaago ttaacaggitg otactocaga tggaaggaaa 1980
65 tooggacaac cattagotga tggggtttot coatcaagag gotgtgatgt atotggacot [040
66 actgoagott gtaactcagt tagtaaatta gatcatttta tagcttcaaa tggaacttta 2197
67 titaatoaaa aattooatoo gooagoatta aaaqqtqata atqqattaat qaatttatoa 2160
68 toattaataa qaaqttatti tgatcaaaay ggatttoatg ticaatttaa tgiaatagat 227.0
69 waaaaaatat tacttgcago acaaaaaaat ootgaaaaat atcaagattt aattgttaga 2280
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77 - 213 - ORGANISM: Clostridium butyricum
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80 aatobagaat oobaagatat taaabotbaa gtaatgttta ataaaaattt atgtabaaaa 180
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64 atadataasa qosaatqtad aqaqtqtada aaatqtqttq ataattqdtt aaqqqqqda 300
85 ottgittatig aaggaaggaa tiacagtgit gaagacgita taaaggaati gaaaasagat 300
be agtgttcaat atagaagato aaacggtgga attacactat ctggagggga agtattactt 410
67 daacdagatt tigitagigga gottittaaaa gagigtaaat cataiggoig goacacigoo 480
88 attqaaacaq caatqtatqt taataqtqaa totqtaaaaa aaqtaattoo atatataqat 540
FM otggotatja tigatataaa aaguatgaat gatgaaatoo ataggaaatt tabaggagtg 600
ዋው agtaaogasa taatattada aaadattaaa ttaagtgatg aattagotaa agaaataata 🕬
31 atbaqaatto otgtaataga aggatttaat goagatttab aaagtatagg agbaatagot 700
91 quattittosa aatoattaad aaatottaaa agaatagato tiottocata odataattat 78)
43 qqaqaaaata agtatcaago aattggaaga gagtattott tgaaagaact aaaatcacct 840
94 aqtawagada aaatggaaag attaaaagot ttagttgaaa toatgggaat accgtgcaca 400
HE attggagetg agtaa
                                                                      915
95 - 110 · SEQ ID NO: 3
93 - 111 - LENGTH: 28
100 H21. D TYPE: DNA
101 - 2130 OFGANISM: Clostridium butyricum
28
1.4 tagataaaac aaacaaaaat gttattat
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109 - 212: TYPE: DNA
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112 - 400> SEQUENCE: 4
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PATENT APPLICATION: US/10/043,639A TIME: 16:21:33

DATE: 04/24/2003

Input Set : D:\Chep004.app

Output Set: N:\CRF4\04242003\J043639A.raw

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114 graduagety asagatycas astattaggt ggassassag cattgatagt tacagatasg 110
11% tittotaaaag ataiggaagg tiggagoigti gaattaabag tiaaatatti aaaagaagbi 1---
116 ggattagatg tigitatatta igaoggagit gaaccaaatc caaaagatgi taatgitata 140
11/ qaaqqattaa aaatatttaa aqaaqaaaat tqtqacatqa taqtaactqt aqqtqqaqqa 300
11% Agitingbatg attgoggtaa gggaatagga attgotgbaa bacatgaagg agatotttat 160
119 quitatghag gaatagaaac actigicaat coattgocac caatagtage tijtaaatact 400
120 actorcaggaa otgotagtga attaactogt battqtqtat tqactaatab aaaaaagaaa 4++
121 araawattig tiatagitag oliggagaaat tigoototag talotalaaa igalocaatg (40)
1.00 ottatggtos sassacotgo aggattasca gosgotacag gastggatgo tittascacat 600
10% gwaatagaag catatgtato aaaagatgoa aatocagtaa cagatgotto agcaatacaa 660
114 gebattaaat taatotoada aaatotaaga daagotgtag oottaggaga aaatotogaa 7.0
105 gbaaqagaaa atatggotta tgbatbatta btagbaggaa tggbatttaa taatgbtaat 780
10% thadwatatg tacatgcaat ggotcatcaa ttagggggac tgtatgatat ggcacatggt 840
1.7 quidetaatg caatgetatt accacatgit gaacgitata atatgetate aaateetaag 900
1.1. aagtttgcag atatagcaga atttatggga gaaaatatat otggacttto tqtaatggaa 960
110 qoaqoaqaqa aaqooataaa tqoaatqtto aqqotttoaq aqqatqttqq aattooqaaa 10.0
130 aqtotaaaqq aqatqqqaqt qaaacaaqaa qattttqaqc atatqqcaqa actaqctott 1080
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131 tittaaggotg ottattaa
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136 KB11 LENGTH: 4963
137 HU12 - TYPE: DNA
135 -0.115 - ORGANISM: Clostridium putyricum
140 -:400 - SEQUENCE: 5
141 qaataaaagt tabotataaa tgataaaagt battattaga taacttitta tiittaaaaata 🕬
142 abtactaata aadagttoaa agaatattac agtagacatt tgaaagaatg caatgataaa 1.0
143 caattgtatt agstittaact tiagataaaa caaacaaaaa tgitattatt agccaagaaa 180
144 atactyttac aaaagaaaag agaaaaacat agcaaaagag taccaatatt aagcaataaa 040
145 mittottaaa atattatosa tasaatgata agattagata aascaagtaa gastgigatt 500
146 dyaggagtaa aaatgataag taaaggattt agtabocaaa cagaaagaat aaatatttta 866
147 Auggeteaaa tattaaatge taaaccatgt gttgaatcag aaagagcaat attaataaca 4.0
144 quatcattta aacaaacaga aggocagoca goaattttaa qaaqagcatt ggcattqaaa 440
149 hadatadtig aalatatood tataadaatt agagatdaag aadttatagt gggaagtita 540
150 actaaagaac cagatgotto acaagtattt ootgagtttt otaataagtg gttacaagat \psi\psi\psi
151 gaattggata gattaaataa gagaactgga gatgcattoo aaatttaaga agaaagtaaa 660
151 gaaaaattaa aayatgtott tgagtattgg aatggaaaga caacaagtga gttagcaact 710
15% thatatatga baqagyaaab aaaagatgoa gtaaattgtg aagtatttab tqtagqaaab (%).
154 tactattata atigograph acathtatet granattath gaaaagtatt aaggeringa 840
15\% thaatggga ttataaatga ggotaaggaa caattagaaa aaaacaggag tatagatoot 96\%
15) gattitataa agaaagaaaa attootaaat agtgitatta totoatgoga agotgoaata 9x0
10^{\circ} a matatgiaa, atagatatgo taaaaaggot aaagagattg cagataatac aaaagatgoa 1000
188 awaagaaaag cigaattaka igaaatagca aaaaittigti caaaagatac aggagaggga 1680
18.4 girtaaatotti totatgaago atgtoaatta tittiggittia tacatgoaat aataaatata 1940
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161 gaaaatgata agaatattab agataagtti getattaaat taatagattg taattggatt 1260
162 amattaaatg atattaataa agtaagagat magatttoaa otamacattt tyytyyttäö 1320
163 chitatytato aaaaattaat tyttyyyyyt caasattoay aagyaaaaya tyoaactaat 1380\,
164 awagtatoat atatggottt agaagoagot gtodatgtaa agttgootea gooatetttg 1440
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PATENT APPLICATION: US/10/043,639A TIME: 16:21:33

DATE: 04/24/2003

Input Set : D:\Chep004.app

Output Set: N:\CRF4\04242003\J043639A.raw

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m e}$ l".: gotobattab otttottgtb abbabatgtt gataattgta toggaaaagg aaagagbaat $1\,\mathrm{Ae}$ 1% baagotgtag gtgbagaaba taabbtbagt ggabbabaag gtgttggagt agetaabatt 14% (1%4 ggagattbat tagttgbagt taaaaaaaatt gtgtttgatg aaaataagat tabtbbtba 1%4%1% gaattaaaga aaabattaaa taatgattit aaaaattoag aagaaataba agoottabta 🛴 176 aaaaatgoto obaagootgg aaacgatatt gatgaagotg ataatotago bagagagggt 1160100 goattagtat actgtagaga agttaataaa tatacaaato caaggggagg aaattttcaa ...0 17% obaggattat atodatotto aattaatgta tattttggaa gottaabagg tgotabtoba 1.7%10 + gatggaagga aatooggada abbattagot gatggggttt btobatcaag aggotgtgat 1949 15% gtatotygas stastgeage tigicastes gitagiaaat tagatsattt tatagittis 34%160 aatggaactt tastsaatca aaaattooat oogtoagoat taaaaggtga taatggatta 7400lfo atgaatttat patcattaat aagaagttat titgatbaaa agggatitoa tysticaattt (0.10)16) aatgtaatag ataaaaaaaat attacttgca gcacaaaaaa atcctgaaaa atatcaagat $\mathbb{C}^{2,0}$ 164 ttaattqtta qaqttqcaqq atataqtqca caqttcattt otttaqataa atctattcaa .764/ 188 aatgatatta tigbaagaab tgaabatgit atgtaaagab agottitaaa ggggataaaa 1200186 gtaatgagta aggagataaa aggogtttta tttaadatab aaaaatttto gttadatgat LT+1 167 gggootggaa taagaactat agtattttt aagggatgtt caatgttgtg ottatggtgt 18.1 154 agtaatobag aatobbaaga tattaaabot baagtaatgt ttaataaaaa tttatgtaba DAN 16 + aaatgtggaa gatgtaaato toaatgtaaa agtgoaggta tigatatgaa tibagaatat (194) 18° aggatagata asagcasaty tabagagtyt acasasatyty ttystaatty ottaagogyy 800° 181 gbabbbgbba bbgaaggaag gaabbabagbb gbbgaagabg bbabasagga abbgaaaaaa 2000 1% gatagtytto aatatagaag atoaaaoggt ggaattadad tatotggagg ggaagtatta <math>3%%190 ottoaaccag attitigoagt ggagottita aaagagtgta aatcatatgg otggoacact 31% 194 godattgaaa bagbaatgta tgttaatagt gaatotgtaa aaaaagtaat tobatatata 3040 19) gatotgotta tgattgatat aaaaagtatg aatgatgaaa tooataggaa atttacagga xx/// 196 gtgagtaacg aaataataatt acaaaaadatt aaattaagtg atgaattago taaagaaata 🔊 🕬 ataatbagaa tibotgiaat agaaggatti aatgbagatt tabaaagtat aggagbaata 🖼 🗸 19% gotcaattti caaaatoatt aacaaatott aaaagaatag atottottoo ataocataat 54%) 13 (batggagaaa ataagtatoa agbaattgga agagagtatt bittgaaaga actaaaaatca ${eta}4{eta}$ 200 potagtaaag acaasatgga aagattaaaa gotttagttg aaatoatggg aatacogtgo 2000 201 abalatograp otgaqtasta gtaqotttab abbaqatatt tilaaasabas tittassitta $\phi(\phi)$ 200 amaggaging attgentiate against attatt agt mechanist abetattage ± 700 205 gagoaaatto adtatoadta diaqdigaaa qatqoaaaat attaqdigda aaaaaaqoat 2780 204 tgatagttas agataagtti otaaaaagata tggaaggtig agotigtigaa titaacagtta 8840 20% aatattiaaa adaaqotdda ttadatdtta tatattatia oddaittdaa ocaaatccaa 3900 200 aagatgitaa tgiratagaa ggattaaaaa tatttaaaga agaaaattgi gacatgatad 3960 -taactgtagg tggaggaagt togcatgatt goggtaaggg aataggaatt gotgbaacab 4000 208 atgaadgaga totstatgat tatgzaggaa tagaaacazt tgtzaatzca ttgzczczaa 40%200 tagtagotgt saatabtadt graggaaotg otagtgaatt aartogtbat tgigtattga 4140 210 otaatacaaa laadaalaata laaatttigita tadttadotd dadaalattid oototagrat 4200 211 otataaatga toosaatyott atootosassa sacotoosaga attaabaara gorahaygas 4200 12 topdatpoitti aanavatuos atadaausat atotatosaa agatopsaast poagtaabag 4329 213 atgottoago katicaadon attaaattaa tittoacakaka ittaagacii gotgiadott 430

DATE: 04/24/2003 PATENT APPLICATION: US/10/043,639A TIME: 16:21:33

Input Set : D:\Chep004.app

Dutput Set: N:\CRF4\04242003\J043639A.raw

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010 atgatatggo abatggtgtt gotaatgbaa tgotattaco acatgttgaa ogttataata 4500
17 tgctatcaaa tootaagaag tttgcarata tagcagaatt tatgggagaa aatatatotg 4000
118 gaotttotgt aatggaagea goagagaaag obataaatgo aatgttoagg otttoagagg 4680
11^{4} atqttqqaat toogaaaagt otaaaggaqa tqqqaqtqaa acaagaagat tttqaqcata 4740
IL20 tggcaqaact aqototttta qatggaaatg cotttagcaa tocaayaaaa ggaaatycaa 4800
2.1 aagatattat aastattttt aaggetgett attaattaat aetatttaaa ggatteaaag 4860
Lir taaaagataa aadatatata tattagatti aagattitat tataggotaa caacaaagaa 4920
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327 - 211> LENGTH: 783
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                                    25
236 20
                                                        31)
23% Leu Ile Thr Glu Ser Phe Lys Gln Thr Gly Gln Pro Ala Ile Leu Arg
                                40
                                                    4 5
241 Arg Ala Leu Ala Leu Lys His Ile Leu Glu Asn Ile Pro Ile Thr Ile
   50
                            5.5
144 Arg Asp Gln Glu Leu Ile Val Gly Ser Leu Thr Lys Glu Pro Arg Ser
145 65
                        70
                                            75
147 Ser Gln Val Fhe Pro Glu Phe Ser Ash Lys Trp Leu Gln Asp Glu Leu
                                        90
348
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050 Asp Arg Leu Ash Lys Arg Thr Gly Asp Ala Phe Gln Ile Ser Glu Glu
251
                                    105
253 Ser Lys Glu Lys Leu Lys Asp Val Phe Glu Tyr Trp Ash Gly Lys Thr
                                1.20
           115
Not The Ser Glu Leu Ala The Ser Tyr Met The Glu Glu The Arg Glu Ala
5.7
                            135
159 Val Ash Cys Glu Val Phe Thr Val Gly Ash Tyr Tyr Tyr Ash Gly Val
160 145
                       150
                                           155
101 Gly His Val Ser Val Asp Tyr Lys Val Leu Arg Val Gly Phe Asr. Gly
                                       170
                   165
18th The The Ash Glu Ala Lys Glu Gln Leu Glu Lys Ash Arg Ser Asp Pro
2++6
               180
                                   185
                                                       190
108 Asp Phe Ile Lys Lys Glu Lys Phe Leu Asn Ser Val Ile Ile Ser Cys
269
                                                    205
           195
271 Glu Ala Ala Ile Thr Tyr Val Asn Arg Tyr Ala Lys Lys Ala Lys Glu
                            215
                                                220
       210
274 Ile Ala Asp Asn Thr Ser Asp Ala Lys Arg Lys Ala Glu Leu Asn Glu
27! 21.5
                       230
                                            235
2"" Ile Ala Lys Ile Cys Ser Lys Val Ser Gly Glu Gly Ala Lys Ser Phe
                                        250
                   245
280 Tyr Glu Ala Cys Gln Leu Phe Trp Phe Ile His Ala Ile Ile Asn Ile
               260
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VERIFICATION SUMMARYDATE: 04/24/2003PATENT APPLICATION:US/10/043,639ATIME: 16:21:34

Input Set : D:\Chep004.app

Output Set: N:\CRF4\04242003\J043639A.raw

L:14 M:271 C: Current Filing Date differs, Replaced Current Filing Date